MMS ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Area(s): Chukchi Sea

Title: Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA): Chemistry and Benthos (CAB) (AK-08-03)

MMS Information Need(s) to be Addressed: This study will constitute a key component of Chukchi Sea environmental studies pertinent to Chukchi Sea Lease Sale 193 scheduled for 2008. Industry has expressed strong interest in leasing in this area, likely followed by exploration and possibly development. The MMS analysts and decision makers will use the information in NEPA analysis and documentation for Lease Sales, EPs and DPPs and in post-sale and post-exploration decision making in the Chukchi Sea.

Total Cost: $2,560,000 **Period of Performance:** FY 2008-2012

Conducting Organization: University of Texas at Austin

MMS Contact: Chief, Alaska Environmental Studies Section

Description:

Background: The November 2006 COMIDA workshop described the importance of benthos and chemical monitoring to evaluate the health of the Chukchi ecosystem. The MMS Scientific Committee (SC) recommended an adaptive initial two year sampling program that closely coordinated separate chemical and benthos monitoring efforts. This document combines those two efforts.

Benthic biological monitoring needs to be initiated in order to establish a current benthic community baseline prior to new oil and gas exploration activities. Our knowledge of the benthic fauna along the Chukchi shelf is largely based on MMS/Outer Continental Shelf Environmental Assessment Program (OCSEAP) surveys between the 1970's and early 1990's. A review of this information revealed "hot spots" of high and highly variable benthic biomass in several regions of the Chukchi Sea. The high abundance of bottom fauna was correlated with high pelagic primary production, possibly associated with the ice-edge and most of which reached the seabed ungrazed. With the retreat of the summer ice-edge to deeper, more northern waters in recent years, this pelagic/benthic coupling may be weakening. Recent changes in seabird and marine mammal distributions described in the COMIDA workshop may reflect undocumented changes in benthic hot spots in the Chukchi Sea as well as greater retreat of the ice pack.

Among the primary concerns about offshore oil and gas are anthropogenic inputs of metals and hydrocarbons. Earlier MMS/OCSEAP-sponsored monitoring design workshops for the Beaufort Sea and Bering Sea recommended that MMS develop multiyear contaminant baselines prior to offshore development. The Oceanography/Fate and Effects working group of the COMIDA

Workshop considered multi-year monitoring of sediment metals, hydrocarbons, and other anthropogenic compounds to be a priority.

Objectives:

- Establish baseline for benthic biomass, species composition, and oil industry anthropogenic chemicals to detect changes as the result of future oil and gas activities.
- Initiate past and future time trend analyses for benthic populations and anthropogenic chemicals
- Distinguish among changes due to development, climate, and food web structure
- Identify natural or other anthropogenic sources of contaminants to the study area.
- Initiate and develop a conceptual food web related to bioaccumulation and risk of trophic transfer of oil industry anthropogenic chemicals.

Methods: MMS anticipates substantial collaboration and coordination of CAB with other Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA) projects: Distribution and Relative Abundance of Marine Mammals: Aerial Surveys and Impact Monitoring of Offshore Subsistence Hunting. CAB will collaborate directly with the Alaska Monitoring and Assessment Program (AKMAP) and more site-specific oil industry studies. We anticipate sharing logistical platforms and samples.

For anthropogenic chemicals, the 2-year sampling strategy collects surface sediments for the determination of standard sediment hydrocarbon parameters such as polycyclic aromatic hydrocarbon (PAH), relevant metals, including the Environmental Protection Agency (EPA) priority metals [total iron (Fe), manganese (Mn), aluminum (Al), barium (Ba), chromium (Cr), vanadium (V), lead (Pb), copper (Cu), cadmium (Cd), nickel (Ni), arsenic (As), silver (Ag), mercury (Hg), selenium (Se), beryllium (Be), thallium (Tl), tin (Sn), antimony (Sb), and zinc (Zn)]; supporting/normalizing parameters such as grain size, organic carbon or organic matter, etc.; and sourcing parameters such as diagnostic hydrocarbon ratios. The biological sampling is combined with the sediment sampling and Contractor-selected other sampling/assays/analyses to complete a sediment triad approach to evaluating effects of ambient anthropogenic chemical levels.

There is a full Quality Assurance/Quality Control (QA/QC) program with inter-laboratory comparisons and reference standards. Normalization techniques developed in MMS Beaufort Sea monitoring will be adopted to minimize sample variability.

Pre-drilling activity baseline sampling was conducted in 2009, emphasizing the area leased by industry in the proposed Chukchi Sea oil and gas lease sale held in February, 2008. Additional adaptive sampling will occur in 2010, predicated on the findings and success in 2009 and locations of likely oil industry post-sale activities. Dated sediment cores are used to capture interannual variability of anthropogenic chemicals and normalization techniques to minimize effects of sample variability. Sampling design will be adaptive to incorporate locations of concentrated bird and marine mammal feeding and their prey within the COMIDA area. To identify sources of anthropogenic chemicals to the study area, limited sampling will be conducted of sources such as water column, air, drilling mud, river input, seeps, or shoreline erosion.

A conceptual food web model related to bioaccumulation and trophic transfer of potential oil industry contaminants is part of initial study planning based on literature review and data-mining. Water and biota sampling are conducted to better understand pelagic/benthic coupling and other trophic transfer. The food-web model will be risk-based, conceptually considering mechanism, magnitude, and likelihood of contaminant transfer. The model will continue to be developed and updated throughout COMIDA, incorporating COMIDA results and other information, and will also be used as a tool to refine sampling strategy during COMIDA and recommend post-COMIDA monitoring strategy.

Current Status: Ongoing

Final Report Due: 2012

Publications Completed:

Dunton, K. H., L. W. Cooper, J. M. Grebmeier, R. Harvey, B. Konar, D. R. Maidment, S. V. Schonberg, and J. Trefry. 2010. An Integrated Chemical and Biological Study of the Benthos of the Chukchi Sea: Preliminary Results from the COMIDA Program [abstract]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 20Anchorage, AK: Alaska Marine Science Symposium.

Grebmeier, J. M., L. W. Cooper, R. Simpson, and L. Beaven. 2010. Chukchi Sea Infaunal Population Structure and Sediment Tracers as part of the MMS COMIDA and Shell Oil Exploration Environmental Studies [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 105Anchorage, AK: Alaska Marine Science Symposium.

Guarinello, M. L., L. W. Cooper, and J. M. Grebmeier. 2010. Epibenthic Habitats of the Bering and Chukchi Seas Observed and Categorized During COMIDA, BEST-BSIERP, and Shell Oil Exploration-Supported Seafloor Video Surveys [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 103Anchorage, AK: Alaska Marine Science Symposium.

Harvey, H. R., and K. A. Taylor. 2010. Organic Contaminant Distribution in Shelf Sediments and Biota of the Chukchi Sea: Initial Results from the COMIDA Program [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 104Anchorage, AK: Alaska Marine Science Symposium.

Hersh, E. S., and D. R. Maidment. 2010. Managing COMIDA Project Data for the Chukchi Sea Marine Ecosystem [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 99Anchorage, AK: Alaska Marine Science Symposium.

Konar, B., M. Schuster, J. M. Grebmeier, L. W. Cooper, R. Harvey, K. H. Dunton, S. V. Schonberg, and J. Trefry. 2010. COMIDA: Epibenthic Community Structure [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 101Anchorage, AK: Alaska Marine Science Symposium.

McTigue, N. D., S. V. Schonberg, and K. H. Dunton. 2010. Ecosystem characteristics based on benthic biomass, density, and stable isotopic signatures from Chukchi Sea cruise COMIDA [Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 101Anchorage, AK: Alaska Marine Science Symposium.

Trefry, J., R. P. Trocine, and H. R. Harvey. 2010. Trace Metals in Seawater, Sediments and the Northern Neptune Whelk (*Neptunea heros*) from the Chukchi Sea, COMIDA Project

[Poster]. In *Alaska Marine Science Symposium Book of Abstracts*, p. 100Anchorage, AK: Alaska Marine Science Symposium.

Affiliated WWW Sites: http://www.mms.gov/alaska/

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